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# Gender differences in science, technology, engineering, mathematics and computer science (STEM) programs at university

*by Darcy Hango*

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| | |
|---|---|
| . | not available for any reference period |
| .. | not available for a specific reference period |
| ... | not applicable |
| 0 | true zero or a value rounded to zero |
| $0^s$ | value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded |
| p | preliminary |
| r | revised |
| x | suppressed to meet the confidentiality requirements of the *Statistics Act* |
| E | use with caution |
| F | too unreliable to be published |
| * | significantly different from reference category (p < 0.05) |

# Gender differences in science, technology, engineering, mathematics and computer science (STEM) programs at university

by Darcy Hango

## Overview of the study

Women represent the majority of young university graduates, but are still underrepresented in science, technology, engineering, mathematics and computer science (STEM) fields. This article provides more information on women with STEM university degrees, and examines whether mathematical ability in high school is related to gender differences in STEM university programs.

- According to the National Household Survey (NHS), women accounted for 39% of university graduates aged 25 to 34 with a STEM degree in 2011, compared with 66% of university graduates in non-STEM programs.

- Among STEM graduates aged 25 to 34, women accounted for 59% of those in science and technology programs, but accounted for 23% of those who graduated from engineering and 30% of those who graduated from mathematics and computer science programs.

- Men aged 25 to 34 with STEM degrees, who are more concentrated in engineering, had lower unemployment rates, higher wages and a lower rate of job mismatch than their non-STEM counterparts. The labour market outcomes of women with STEM degrees, who are more concentrated in science and technology, did not clearly differ from non-STEM women in this age group.

- Students who chose a STEM university program had higher PISA (Programme for International Student Assessment) mathematics scores at age 15, higher mathematics marks in high school, and had a more positive perception of their mathematical ability than those who opted for other fields of study.

- Women are always less likely to choose a STEM program, regardless of mathematical ability. Among those who went to university, 23% women in the three highest categories of PISA scores (out of six) chose a STEM program, compared with 39% of men in the three *lowest* categories of PISA scores.

## Introduction

In Canada and elsewhere in the world,[1] encouraging university students to choose a program in science, technology, engineering, mathematics and computer science (known as 'STEM' programs) has long been a defining outcome of national innovation strategies.

The focus on STEM degrees can be related to how they would contribute to a country's competitiveness and economic prosperity. Given the scope and nature of their labour market activities–for instance, by engaging in research and development or other knowledge-enhancing activities–STEM graduates are considered key inputs of the national innovation system.[2] At the individual level, previous reports have also suggested that a STEM degree would lead to better labour market conditions and higher earnings, especially for those with a background in engineering and computer science.[3]

That said, and despite the advances made in recent years,[4] women remain less likely to choose a career in STEM areas, and more particularly in engineering, mathematics and computer science. This stands in contrast to nearly all other fields of study, where women now represent the vast majority of graduates— especially health and social science programs. Why are women staying away from STEM programs?

This article examines gender differences in program choice and graduation. First, it profiles differences between men and women among recent STEM university graduates aged 25 to 34, using data from the 2011 National Household Survey (NHS). It also examines whether STEM university graduates have better labour market outcomes than non-STEM university graduates.

In the second part of this article, the factors associated with university program choice are examined for both men and women, using longitudinal data from the Youth in Transition Survey–Program for International Student Assessment (YITS–PISA). Of particular interest is the relationship between mathematical ability at age 15 and choosing a university STEM program.[5]

## Most STEM university graduates are men

Young adults are more and more likely to obtain a university degree, regardless of gender. However, women have made gains much more rapidly than men in recent years. In 1991, the proportion of men and women aged 25 to 34 with a university degree was about the same (at 16%); by 2011, the proportion had increased to 37%

**Chart 1  Number of STEM university graduates aged 25 to 34, by sex, 2011**
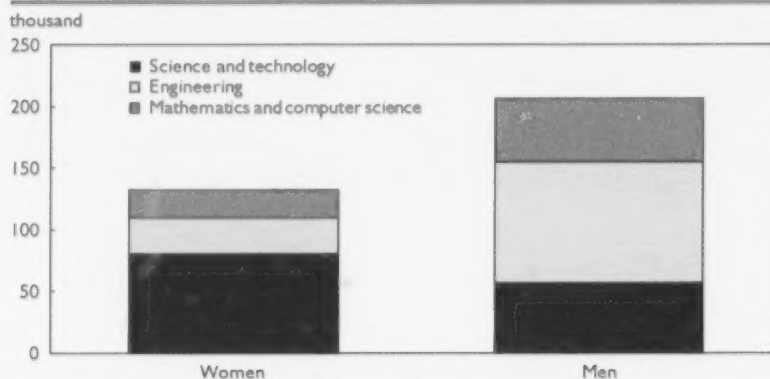


Note: STEM includes science, technology, engineering, mathematics and computer science.
Source: Statistics Canada, National Household Survey, 2011.

among women and 27% among men. As a result, 59% of all university graduates aged 25 to 34 in 2011 were female.[6]

The share of female university graduates increased in nearly all fields of study, including STEM programs. Hence, in 2011, 39% of STEM university graduates aged 25 to 34 were female, compared to 23% of STEM graduates aged 55 to 64. However, women represented 66% of all non-STEM graduates aged 25 to 34 in 2011 (a proportion that was in the 80% range in health professions and related programs, and in education programs). Women were thus proportionately under-represented among STEM graduates, at least compared with other fields.

Furthermore, women with a STEM degree were particularly concentrated in science and technology programs. Specifically, women accounted for 59% of graduates who had a university degree in science and technology, but accounted for 23% of graduates aged 25 to 34 with a university

degree in engineering, and 30% of those with a degree in mathematics and computer science. Thus, 39% of the 132,500 women aged 25 to 34 who had a STEM degree had a background in engineering, mathematics or computer science (Chart 1).[7] In comparison, 72% of the 206,600 STEM-educated men had a background in these fields (47% in engineering and 25% in mathematics and computer science).

## Labour market outcomes not always the same for all STEM graduates

The better labour market outcomes of young graduates with a STEM degree are often used as motivational factors to encourage students to choose a STEM degree.[8] Labour market conditions, however, may vary across gender, type of program, and indicators of labour market performance.

One of these indicators is the unemployment rate. In 2011, the unemployment rate for men aged 25 to 34 with a STEM university degree

was 4.7%, compared with 5.5% for those with a non-STEM university degree. For women, it was the opposite: the unemployment rate of women with a STEM university degree was 7.0%, compared with 5.7% among those with a non-STEM degree (Table 1).

Men with a STEM university degree were also less likely than non-STEM graduates to be working in occupations requiring a high school education or less—a form of 'skills mismatch'.[9] Among men aged 25 to 34 with a STEM university degree, 12% were in occupations generally requiring a high school diploma or less, compared with 22% among those with a non-STEM university degree. Among women, 18% of STEM graduates were in occupations

requiring a high school diploma or less, a percentage that was very similar to that of women with a non-STEM university degree.[10]

Examining skills mismatch within STEM groups is also important, as it may help explain the larger proportion of female STEM university graduates that were in occupations requiring a high school diploma or less, compared with their male counterparts. In 2011, 18% of university science graduates were employed in occupations requiring a high school diploma or less, compared with 11% of those with an engineering degree. Therefore, the relatively higher mismatch rate of female STEM university graduates can be explained, in part, by their larger share in programs

with higher mismatch rates (for example, science) and their lower share in programs like engineering.

Similarly, the relatively lower mismatch rate of non-STEM female university graduates (19%) compared with their male counterparts (22%) can be explained, at least in part, by the fact that many women graduated from non-STEM programs in which mismatch rates are relatively low— for example, education (10%) and health professions and related programs (10%).

That STEM programs would also lead to better-paying jobs is often used as a selling point to encourage more youth to pursue such programs.[11] According to the NHS, this was true, but even more so for men:

**Table 1   Labour market outcomes of university graduates aged 25 to 34, by sex and major field of study, 2011**

|  | Total | Women | Men |
|---|---|---|---|
|  | percentage | | |
| **Unemployment** | | | |
| Total STEM | 5.5 | 7.0 | 4.7 |
| Science | 6.2 | 6.6 | 5.8 |
| Technology (except engineering technology) | 5.1 | 3.4 | 6.7 |
| Engineering | 4.9 | 7.1 | 4.3 |
| Mathematics and computer science | 5.4 | 8.5 | 4.2 |
| Non STEM | 5.6 | 5.7 | 5.5 |
| **Skill mismatch[1]** | | | |
| Total STEM | 14.3 | 18.3 | 11.8 |
| Science | 18.0 | 18.9 | 16.8 |
| Technology (except engineering technology) | 22.2 | 20.5 | 23.5 |
| Engineering | 10.6 | 13.5 | 9.8 |
| Mathematics and computer science | 13.6 | 22.4 | 10.1 |
| Non STEM | 19.7 | 18.5 | 22.2 |
|  | dollars | | |
| **Median wages and salaries[2]** | | | |
| Total STEM | 59,300 | 53,200 | 62,300 |
| Science | 51,700 | 49,100 | 55,300 |
| Technology (except engineering technology) | 51,700 | 49,700 | 54,600 |
| Engineering | 65,200 | 61,100 | 66,300 |
| Mathematics and computer science | 59,300 | 54,900 | 60,800 |
| Non STEM | 52,200 | 50,200 | 56,000 |

1. Percentage of persons working in occupations requiring a high school education or less. Includes persons who were employed during the NHS reference week, or weren't employed but last worked in 2010 or 2011. Similar differences were found between groups when the sample was restricted to employees working full year, full-time in 2010.
2. Gross wages and salaries before deduction, employees working full year, full time in 2010.
Note: STEM includes science, technology, engineering, mathematics and computer science.
Source: Statistics Canada, National Household Survey, 2011.

in 2010, men aged 25 to 34 who had a STEM university degree and were employed on a full-time and full-year basis earned a median of $62,300, versus $56,000 for those who graduated from non-STEM programs.[12] The gap was smaller among university-educated women: STEM graduates employed full-time, full-year, had median salaries and wages of $53,200, compared with $50,200 for non-STEM graduates.

If STEM-educated men are earning more than non-STEM-educated men, however, it is largely because they are concentrated in engineering, where earnings are significantly higher. Men with a degree in engineering earned $66,300, compared with men with a degree in science and technology, who earned about $55,000.

Conversely, women with a degree in a science or technology field—where they were more concentrated— earned just under $50,000, that is, about the same as non-STEM graduates ($50,200) and significantly less than women with a degree in engineering ($61,100).

## Mathematical ability in high school and program choice at university

Past studies have attempted to understand why women were less likely than men to enter and complete a STEM university program. For some, gender differences in mathematical ability—a prerequisite to success in these fields of study— would explain why fewer women are found in such programs.[13] For others, the gender gap is rather a by-product of differences in values and preferences.[14] Which of these assumptions is supported by the data?

**Chart 2    First university program choice among YITS-PISA respondents who attended university**
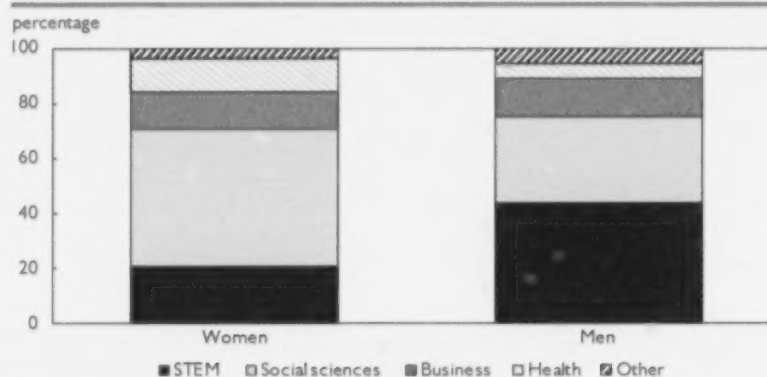


Note: STEM includes science, technology, engineering, mathematics and computer science.
Sources: Statistics Canada and Human Resources and Skills Development Canada, Youth in Transition Survey (YITS); Organisation for Economic Co-operation and Development, Programme for International Student Assessment (PISA), 2000 to 2010.

Longitudinal data from the Youth in Transition Survey and the Program for International Student Assessment (YITS–PISA) can be used to better understand the relationship between mathematical ability and the choice of a STEM university program among men and women. The YITS–PISA interviewed a sample of youth aged 15 in 2000, and re-interviewed them every two years until they were 25. With this data, some key educational characteristics measured during adolescence (including PISA tests conducted when students were aged 15) can thus be linked with other measures collected in subsequent years, including program choice in university (see *Data sources, methods and definitions*).

Overall, 40% of men in the YITS-PISA sample who went to university in early adulthood opted for a STEM program as their first choice in university, while only 20% of women did so (Chart 2).[15] In fact,

young women were much more likely to choose a first program in social sciences (50%, compared to 32% of men among those who went to university).

Those who chose a STEM program had higher PISA test scores when they were in their mid-teens than those who chose other programs (Table 2). For example, women who chose a STEM program had obtained an average mathematics PISA score of 588 at age 15, compared with 565 among those headed for social sciences. Among men, those who chose a STEM program had achieved a score of 597 on average, compared to 585 among those who chose social sciences. Males also tended to have higher PISA scores than women on average (589 versus 569).[16]

In order to control for mathematical proficiency levels, the sample can be divided between those who had "higher" PISA scores at age 15 (mathematics proficiency levels 4, 5 and 6—a PISA score of 545 and over)

and "lower" PISA scores (levels 1, 2 and 3). Those who had higher mathematics proficiency levels were more likely to choose STEM programs than their counterparts with lower proficiency levels. For example, 23% of women with higher mathematics PISA scores entered a STEM program, compared with 15% of those with lower scores (Table 3).[17]

That said, women with *higher* scores were less likely to choose a STEM university program than men with *lower* scores (23% versus 39%). In fact, among women, social sciences were preferred by most, regardless of mathematical proficiency. Men, in contrast, were always more likely to choose a STEM program, even among those who had a lower proficiency in mathematics.

**Table 2   Average mathematics PISA scores at age 15 among YITS-PISA respondents who attended university, by first program choice and sex**

|  | Total | Women | Men |
|---|---|---|---|
|  | average | | |
| Total | 577.8 | 569.3 | 588.5*** |
| STEM | 593.4 | 587.5 | 596.7 |
| Social sciences | 571.8 | 565.3 | 584.7*** |
| Business | 567.8 | 555.4 | 583.2* |
| Health | 571.9 | 570.3 | 576.6 |
| Other | 570.4 | 572.2 | 569.1 |
| Weighted sample size | 132,350 | 73,567 | 58,783 |

* p < 0.1; ** p < 0.05; *** p < 0.01 indicates significance of gender difference
Note: STEM includes science, technology, engineering, mathematics and computer science.
Sources: Statistics Canada and Human Resources and Skills Development Canada, Youth in Transition Survey (YITS); Organisation for Economic Co-operation and Development, Programme for International Student Assessment (PISA), 2000 to 2010.

**Table 3   First university program choice of YITS-PISA respondents who attended university, by category of PISA scores and sex**

|  | STEM | Social sciences | Business | Health | Other |
|---|---|---|---|---|---|
|  | percentage | | | | |
| Total | 30.8 | 42.0 | 13.8 | 9.3 | 4.3 |
| Higher mathematics PISA score |  |  |  |  |  |
| Women | 23.2 | 48.3 | 12.6 | 12.4 | 3.6 |
| Men | 45.7 | 31.3 | 13.3 | 5.1 | 4.7E |
| Lower mathematics PISA score |  |  |  |  |  |
| Women | 15.3 | 53.9 | 15.8 | 12.2 | 2.9E |
| Men | 38.5 | 32.2 | 15.4 | F | F |

E use with caution
F too unreliable to be published
Notes: Higher PISA score is defined as 4th proficiency level and above. Lower PISA score is defined as 3rd proficiency level or below. STEM includes science, technology, engineering, mathematics and computer science.
Sources: Statistics Canada and Human Resources and Skills Development Canada, Youth in Transition Survey (YITS); Organisation for Economic Co-operation and Development, Programme for International Student Assessment (PISA), 2000 to 2010.

## Young men with lower marks in high school were more likely to choose a STEM program than young women with higher marks

When high school marks in mathematics were examined instead of PISA scores (Chart 3), similar results were found:

- Students with higher mathematics marks were generally more likely to choose a STEM university program. For instance, more than 40% of women with marks in the 90% to 100% range chose a STEM program, compared with 11% of women with marks under 80%;

- Men were more likely to opt for a STEM program, even in lower-marks categories. More than 30% of men who had marks under 80% and attended university chose a STEM program, compared with about 10% of women in the same category;

- Young women with higher mathematics marks in high school (at least 90% in grade 9 or 10) were less likely to opt for a STEM university program than men with marks in the 80% to 89% range.

YITS also contains self-perceived measures of mathematical ability in high school: "excellent", "very good", "good", "fair", and "poor". With respect to their mathematical ability, young men typically had a better opinion of themselves as 50% perceived their ability to be "very good" or excellent", compared with 37% of young women. Again, those who perceived their mathematical skills more positively were more likely to choose a STEM program later at university.

**Chart 3** Proportion choosing a STEM university program among YITS-PISA respondents who attended university, by high school grades in mathematics
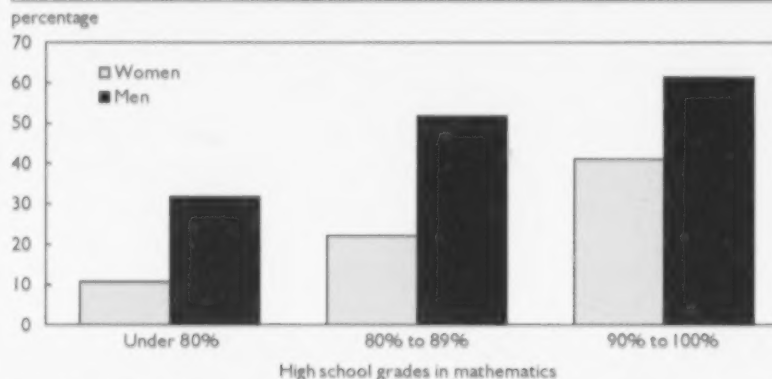


percentage

Note: STEM includes science, technology, engineering, mathematics and computer science.
Sources: Statistics Canada and Human Resources and Skills Development Canada, Youth in Transition Survey (YITS); Organisation for Economic Co-operation and Development, Programme for International Student Assessment (PISA), 2000 to 2010.

Among youth who perceived their mathematics skills to be good, 36% of males opted for a STEM program, compared with 15% of females. Furthermore, 66% of males who perceived their skills to be excellent chose a STEM program, compared with 47% of females. Therefore, there was still a gender difference, even among those who had a better perception of their mathematical ability.

In summary, students with stronger PISA scores, higher marks, and better perceptions of their academic abilities in high school were more likely to opt for a STEM university program. Nevertheless, young men were always more inclined to choose STEM programs than young women for a given level of mathematical ability (regardless of measure). Are such findings the same when all factors that could influence program choice are taken into account (including immigration status, parental influence variables, and reading scores)?

By and large, the answer is "yes". When all factors except marks and self-perceived mathematical ability were accounted for in a model including all YITS-PISA respondents who attended university, both men with higher *and* lower PISA mathematics scores were still more likely to enter STEM fields than women with higher scores (Table 4, model 2). Specifically, men with high scores were most likely to choose such a STEM program by a margin of 22 percentage points over women with equally high scores. In addition, men with lower PISA scores were also more likely to choose a STEM program than women with higher scores, by a margin of 15 percentage points. Conversely, men were always less likely to choose a program in social sciences, by a margin of 12 percentage points among men with lower PISA scores and 16 percentage points among men with higher PISA scores.

The inclusion of marks and self-perceived mathematical ability (Table 4 model 3)—both positively correlated with the choice of a STEM program[18]—reduced the effect of gender on the probability of choosing a STEM program, but only slightly (from 22 percentage points to 18 percentage points among students with higher PISA scores).

As a result, if more men are found in STEM programs, it is not because they have better PISA scores than women. In fact, even when all measures of mathematical ability are combined in a model, gender differences remain significant. This suggests that the gender difference in the selection of a STEM program at university is due to other, unobserved, factors that go beyond academic achievement, parental interactions and influence, and immigration status.

## Conclusion

Over the past few decades, women have made significant advances in university participation, including program areas that had previously been more populated by men. One area, however, remains male-dominated: science, technology, engineering and mathematical (STEM) degrees. And among women who choose to pursue a degree in STEM, most do so in biology or science programs, resulting in even fewer women in engineering, computer science and mathematics programs. These choices have consequences, as fields of study such as engineering and computer science lead, on average, to better outcomes in the labour market in terms of employment, job match and earnings.

For some, aptitude for a particular subject is a factor in university program choice. Although mathematical ability plays a role, it does not explain gender differences in STEM choices. Young women with a high level of mathematical ability are significantly less likely to enter STEM fields than young men, even young men with a lower level of mathematical ability. This suggests that the gender gap in STEM-related programs is due to other factors. Other possible explanations might include differences in labour market expectations including family and work balance, differences in motivation and interest, and other influences.[19]

**Table 4   Marginal effect of choosing a STEM university program across mathematics PISA score results and gender, based on three multinomial logit model scenarios**

| | STEM | Social sciences | Business | Health | Other |
|---|---|---|---|---|---|
| | average marginal effect | | | | |
| **Model 1 PISA score interacted with sex only** | | | | | |
| PISA score by sex (ref: higher-women) | | | | | |
| Higher - Men | 0.224*** | -0.170*** | 0.007 | -0.073*** | 0.011 |
| Lower - Women | -0.080*** | 0.056 | 0.032 | -0.001 | -0.007 |
| Lower - Men | 0.153*** | -0.161*** | 0.029 | -0.057** | 0.036 |
| **Model 2 PISA score interacted with sex, plus demographic, reading scores and parental controls** | | | | | |
| PISA score by sex (ref: higher-women) | | | | | |
| Higher - Men | 0.217*** | -0.156*** | 0.007 | -0.077*** | 0.009 |
| Lower - Women | -0.073** | 0.093* | -0.002 | -0.009 | -0.010 |
| Lower - Men | 0.145*** | -0.117** | -0.006 | -0.057 | 0.034 |
| **Model 3 All variables in model 2, plus mathematical marks and self-assessed mathematical ability** | | | | | |
| PISA score by sex (ref: higher-women) | | | | | |
| Higher - Men | 0.178*** | -0.126*** | 0.004 | -0.074*** | 0.018 |
| Lower - Women | -0.010 | 0.012 | 0.007 | 0.006 | -0.015 |
| Lower - Men | 0.194*** | -0.159*** | -0.010 | -0.053 | 0.028 |
| Weighted sample size | 132,350 | | | | |

* p < 0.1; ** p < 0.05; *** p < 0.01 indicates significant difference from reference (ref) category
Note: STEM includes science, technology, engineering, mathematics and computer science.
Sources: Statistics Canada and Human Resources and Skills Development Canada, Youth in Transition Survey (YITS); Organisation for Economic Co-operation and Development, Programme for International Student Assessment (PISA), 2000 to 2010.

## Data sources, methods and definitions

### Data sources and methods

The first portion of this article, which profiles men and women aged 25 to 34 with a STEM university degree, is based on the 2011 National Household Survey.

This second portion of this paper uses the linked Youth in Transition Survey–Programme for International Student Assessment (YITS–PISA) data, which includes data from the Canadian component of the PISA 2000 survey (when survey respondents were aged 15), and longitudinal data from YITS (Cycle 6) up to age 25. Using these data allows for the linking of characteristics during adolescence with educational outcomes in young adulthood. The choice of a first university program can be identified from Cycle 2 (age 17) through to Cycle 6 (age 25).

In YITS, the respondent's first university program is determined using Classification of Instructional Program (CIP) codes for the first main field of study or specialization. While a person's first program type may not be his or her final program upon graduation (if he or she graduates), first program type does indicate a person's initial interests out of high school. Switching programs does occur for some youth during their time in university; however, some past studies have found that the majority of youths' first programs are those they remain in throughout five years of university.

This analysis is restricted to students who attended university—the sample under consideration does not include those whose first postsecondary education (PSE) program is in a non-university setting and those who do not go into a PSE program prior to age 25. The choice was made only to consider university-bound youth because of comparability challenges between programs at the university and non-university levels. For example, engineering programs are offered at both colleges and universities, but can be quite different with the former being oriented more toward practical job skills. (Students who only attended Quebec CEGEPs over the period are not included in the population of youth who went to university). In all analyses, the appropriate survey weights are utilized as well as the corresponding bootstrap weights.

In this study, the program-type measure recategorized the 13 primary groupings in Classification of Instructional Programs (CIP) 2000 into five categories. The five categories, informed from past literature,[1] are the following:

- social sciences (includes arts, education, humanities, social sciences and law)
- business/management/public administration
- science/math/computer science, engineering and agriculture
- health, parks, recreation and fitness
- other.

For the sake of parsimony, the five category titles have been shortened to the following:

- social sciences
- business
- STEM
- health
- other.

### Definitions

### STEM programs

The analysis in the second part of this paper differs slightly from the standard STEM definition. Because the YITS–PISA sample does not allow for a detailed disaggregation of CIP codes (due to sampling issues), the analysis in the second section is done at the level of primary groupings of CIP 2000, while the recommended standard (used in the first half of this report) was developed using lower levels of CIP 2011. However, population differences between the two definitions are very small overall. For more information on Statistics Canada's recommended STEM groupings, see *Variant of CIP 2011 – STEM groupings*.[2]

### PISA mathematics scores

Mathematical literacy is used in the current context to "indicate the ability to put mathematical knowledge and skills to functional use rather than just mastering them within a school curriculum".[3] In total, 32 mathematics questions were included in the PISA 2000 assessments. This study examines mean levels of mathematical ability from Cycle 1, when survey respondents were 15 years of age. Proficiency levels in mathematics were also created and are used to form a measure tapping into high levels of mathematical ability. In this study, youth defined as having "high" math ability are in the 4th proficiency level or higher (out of a maximum of 6 levels). Youth with "lower" levels of mathematical abilities are in the 3rd proficiency level or lower. Both the sample size and differences between proficiency levels were factored in the definition of "higher" and "lower" mathematical ability.

Other measures of mathematical ability considered in this study are high school marks in mathematics, which were measured at age 15 (Cycle 1), and self-rated mathematical ability, which were measured at age 17 (in Cycle 2). Self-rated mathematical ability was not measured in Cycle 1.

### Multinomial logistic regression

Multinomial logistic regression results have been transformed from multinomial logits to average marginal effects for ease of interpretation. They can be interpreted as the effect of a one-unit change in any given explanatory variable on the probability of choosing each of the university programs, all else being equal.

### Notes

1. See Montmarquette et al. (2002).
2. See Statistics Canada (2013).
3. See Bussière et al. (2001), p. 86.

### Proportion of immigrants who are STEM graduates

Because they operate in a global labour market, the profile of STEM graduates is affected by a substantial degree of labour market inflows and outflows.[1] One indicator of such international interactions is the proportion of immigrants who have a STEM degree.

In Canada, immigrants represent a significant portion of the population with a STEM degree. In 2011, 46% of university-educated immigrant men aged 25 to 34 had STEM degree, compared with 32% of their Canadian-born counterparts (Chart A.1). Among female university graduates aged 25 to 34, immigrants were twice as likely to have a STEM degree as the Canadian-born (23% versus 13%).

As a result, among those aged 25 to 34 with a STEM university degree, 35% of men and 38% of women were immigrants. Moreover, among men aged 25 to 34 with a STEM university degree, 9% were non-permanent residents (7% among women).

Differences between immigrants and the Canadian-born also existed within STEM programs. For instance, among women with a STEM university degree, 17% of the Canadian-born received it from an engineering program, compared

**Chart A.1  Proportion of university graduates aged 25 to 34 with a degree in a STEM program, by sex and immigration status, 2011**
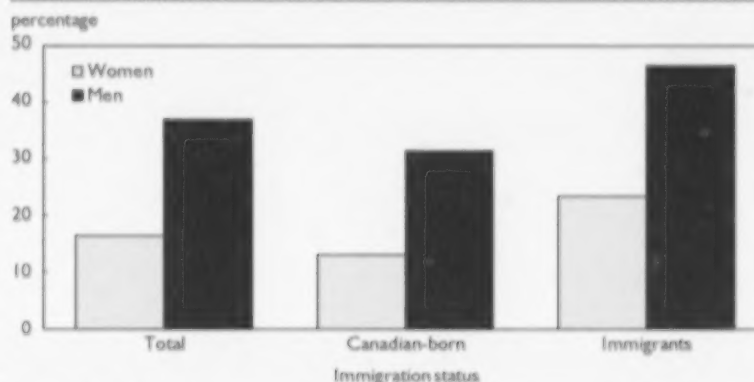


percentage

Note: STEM includes science, technology, engineering, mathematics and computer science.
Source: Statistics Canada, National Household Survey, 2011.

with 28% of immigrants. Also, only 10% of Canadian-born women obtained their STEM degree in mathematics and computer science, compared with 26% of female immigrants.

Finally, of immigrants aged 25 to 34 with a STEM university degree, slightly less than half obtained it outside Canada.

**Note**
1.  See Mishagina (2012).

## Notes

1. See OECD (2012).

2. See Beckstead and Gellatly (2006).

3. See Conference Board of Canada (2013).

4. See Ferguson and Zhao (2013).

5. A longer and more detailed version of the analysis presented in this section is available in the report *Ability in Mathematics and Science at Age 15 and Program Choice in University: Differences by Gender*, by Hango (2013).

6. Source: 2011 National Household Survey and 1991 Census of Population.

7. Because university-educated immigrants were more likely to hold a STEM degree, the proportion of women choosing STEM programs was even lower among the Canadian-born. See *Proportion of immigrants who are STEM graduates*.

8. See Conference Board of Canada (2013).

9. In this section, the people who were not working during the reference week, but who were employed at some time in 2011 or 2010, are included in the universe. For those who did not work during the reference week, the skill match corresponds to the most recent occupation held by the respondent.

10. Even among those who were not working in occupations requiring a high school education or less, not all STEM graduates worked in STEM fields. According to Beckstead and Gellatly (2006), individuals holding "science and engineering degrees" outnumbered individuals employed in science and engineering occupations by a ratio of 2.2 to 1 in the early 2000s.

11. See Conference Board of Canada (2013).

12. Earnings are defined as gross wages and salaries before deductions of paid employees (self-employed workers are excluded).

13. In 2005, Lawrence Summers—then-President of Harvard University—suggested that males were more adept at pursuing careers in fields requiring advanced mathematical ability. See Summers (2005).

14. See OECD (2012); Kane and Mertz (2011).

15. Note that the definition of STEM programs is slightly different in the linked YITS–PISA data than in the National Household Survey (see *Data sources, methods and definitions*).

16. This result was consistent with other studies comparing all males and females 15 years of age (and not only those entering a university program). See Bussière et al. (2007).

17. For men, the difference between those with lower skill levels and higher skill levels was statistically significant at the $p < 0.10$ level only.

18. This is likely the case because more objective measurements of mathematical proficiency might be positively related to school marks at age 15 and self-perceived mathematical ability. In other words, the positive and direct relationship between mathematical proficiency (as measured by PISA scores) and the choice of STEM as a university program may be mediated by both math marks and self-perceived or subjective mathematical ability.

19. Some researchers have suggested that factors related to differences in preferences and labour market expectations could explain part of the gender gap in program choice (Turner and Bowen 1999; Diekman et al. 2010). Others have found that social class, family background and cultural capital in the home were also very important factors (Van de Werfhorst et al. 2003). Finally, a recent OECD (2012) study suggested that "gender disparities in subjects chosen appear to be related more to student attitudes (such as motivation and interest) towards a particular subject rather than to ability and performance at school" (p. 104).

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